# CLAIMS

1. An electro-optic modulator comprising an active material having a first state of transparency and of low reflectivity for one or more wavelengths and a second state of high reflectivity at said one or more wavelengths, wherein said active material reversibly switches between said first and second states.

2. The electro-optic modulator of claim 1, wherein said active material reversibly switches between said first and second states in correspondence with an input electronic signal that encodes binary information.

3. The electro-optic modulator of claim 1, wherein said active material reversibly switches between said first and second states by the injection and removal of electrons.

4. The electro-optic modulator of claim 1, wherein said active material switches from said first state to said second state by the removal of electrons, and switches from said second state to said first state by the injection of electrons.

5. The electro-optic modulator of claim 1, wherein said active material is reversibly switched between said first and second states by the application of an electric current.

6. The electro-optic modulator of claim 1, wherein said active material is reversibly switched between said first and second states by the variation of an applied voltage.

7. The electro-optic modulator of claim 1, wherein said active material does not absorb at said one or more wavelengths in said first and said second states.

8. The electro-optic modulator of claim 1, wherein said modulator comprises a reflective stack comprising:
   (a) two or more active layers comprising said active material having said first and second states and

(b) one or more non-reflective and transmissive layers interposed between each of said two or more active layers.

9. The electro-optic modulator of claim 1, wherein said one or more wavelengths is in the infrared spectrum.

10. The electro-optic modulator of claim 1, wherein said one or more wavelengths is from 1250 nm to 1750 nm.

11. The electro-optic modulator of claim 1, wherein said one or more wavelengths comprises a wavelength band at least 10 nm in width.

12. The electro-optic modulator of claim 1, wherein said one or more wavelengths comprises a wavelength band at least 100 nm in width.

13. The electro-optic modulator of claim 1, wherein said one or more wavelengths comprises a wavelength band at least 1000 nm in width.

14. The electro-optic modulator of claim 1, wherein said modulator is solid state and has no moving parts, wherein said active material does not move when reversibly switched between said first and second states.

15. The electro-optic modulator of claim 1, wherein a reflective surface of said second state of said active material is at from 0° to 90° with respect to an input optical signal.

16. The electro-optic modulator of claim 1, wherein a reflective surface of said second state of said active material is at a 45° angle with respect to an input optical signal.

17. The electro-optic modulator of claim 1, wherein a reflective surface of said second state of said active material is at a 90° angle with respect to an input optical signal.

18. The electro-optic modulator of claim 1, wherein said first state of transparency and of low reflectivity corresponds to the binary information of a logical 1, and said

second state of high reflectivity corresponds to the binary information of a logical 0.

19. The electro-optic modulator of claim 1, wherein said first state of transparency and of low reflectivity corresponds to the binary information of a logical 0, and said second state of high reflectivity corresponds to the binary information of a logical 1.

20. The electro-optic modulator of claim 1, wherein said active material is an organic compound.

21. The electro-optic modulator of claim 1, wherein said active material in one or both of said first and second states is an organic free radical compound.

22. The electro-optic modulator of claim 1, wherein said active material in one or both of said first and second states is a salt of an organic free radical cation.

23. The electro-optic modulator of claim 1, wherein said active material in one or both of said first and second states is a salt of a non-polymeric organic free radical cation.

24. The electro-optic modulator of claim 1, wherein said active material in one or both of said first and second states is a salt of an aminium radical cation.

25. An electro-optic modulator comprising an active material having a first state of transparency and of low reflectivity for one or more wavelengths and a second state of high reflectivity at said one or more wavelengths, wherein said active material reversibly switches between said first and second states, wherein said modulator is solid state and has no moving parts, and wherein said active material does not move when reversibly switched between said first and second states.

26. A method of modulating an optical signal at one or more wavelengths, wherein said method comprises the steps of:

(a) providing an input optical path;

(b) providing an output optical path;

(c) interposing an electro-optic modulator between said input and output optical paths, wherein said modulator comprises an active material having a first state of transparency and of low reflectivity at said one or more wavelengths and a second state of high reflectivity at said one or more wavelengths, and wherein said active material reversibly switches between said first and second states;

(d) providing an optical signal in said input optical path; and

(e) reversibly switching said active material between said first and second states to modulate said optical signal in said output optical path.

27. The method of claim 26, wherein said active material reversibly switches between said first and second states in correspondence with an input electronic signal that encodes binary information.

28. The method of claim 26, wherein said reversible switching of said active material between said first and second states is induced by the injection and removal of electrons.

29. The method of claim 26, wherein said active material switches from said first state to said second state by the removal of electrons, and switches from said second state to said first state by the injection of electrons.

30. The method of claim 26, wherein said reversible switching of said active material between said first and second states is induced by the application of an electric current.

31. The method of claim 26, wherein said active material is reversibly switched between said first and second states by the variation of an applied voltage.

32. The method of claim 26, wherein said active material does not absorb at said one or more wavelengths in said first and said second states.

33. The method of claim 26, wherein said modulator comprises a reflective stack comprising:
    (a) two or more active layers comprising said active material having said first and second states and
    (b) one or more non-reflective and transmissive layers interposed between each of said two or more active layers.

34. The method of claim 26, wherein said one or more wavelengths is in the infrared spectrum.

35. The method of claim 26, wherein said one or more wavelengths is from 1250 nm to 1750 nm.

36. The method of claim 26, wherein said one or more wavelengths comprises a wavelength band at least 10 nm in width.

37. The method of claim 26, wherein said one or more wavelengths comprises a wavelength band at least 100 nm in width.

38. The method of claim 26, wherein said one or more wavelengths comprises a wavelength band at least 1000 nm in width.

39. The method of claim 26, wherein said modulator is solid state and has no moving parts, wherein said active material does not move when reversibly switched between said first and second states.

40. The method of claim 26, wherein a reflective surface of said second state of said active material is at an angle from 0° to 90° with respect to said input optical signal.

41. The method of claim 26, wherein a reflective surface of said second state of said active material is at a 45° angle with respect to said input optical signal.

42. The method of claim 26, wherein a reflective surface of said second state of said active material is at a 90° angle with respect to said input optical signal

43. The method of claim 26, wherein said first state of transparency and of low reflectivity corresponds to the binary information of a logical 1, and said second state of high reflectivity corresponds to the binary information of a logical 0..

44. The method of claim 26, wherein said first state of transparency and of low reflectivity corresponds to the binary information of a logical 0, and said second state of high reflectivity corresponds to the binary information of a logical 1.

45. The method of claim 26, wherein said active material is an organic compound.

46. The method of claim 26, wherein said active material in one or both of said first and second states is an organic free radical compound.

47. The method of claim 26, wherein said active material in one or both of said first and second states is a salt of an organic free radical cation.

48. The method of claim 26, wherein said active material in one or both of said first and second states is a salt of a non-polymeric organic free radical cation.

49. The method of claim 26, wherein said active material in one or both of said first and second states is a salt of an aminium radical cation.